Figure 1

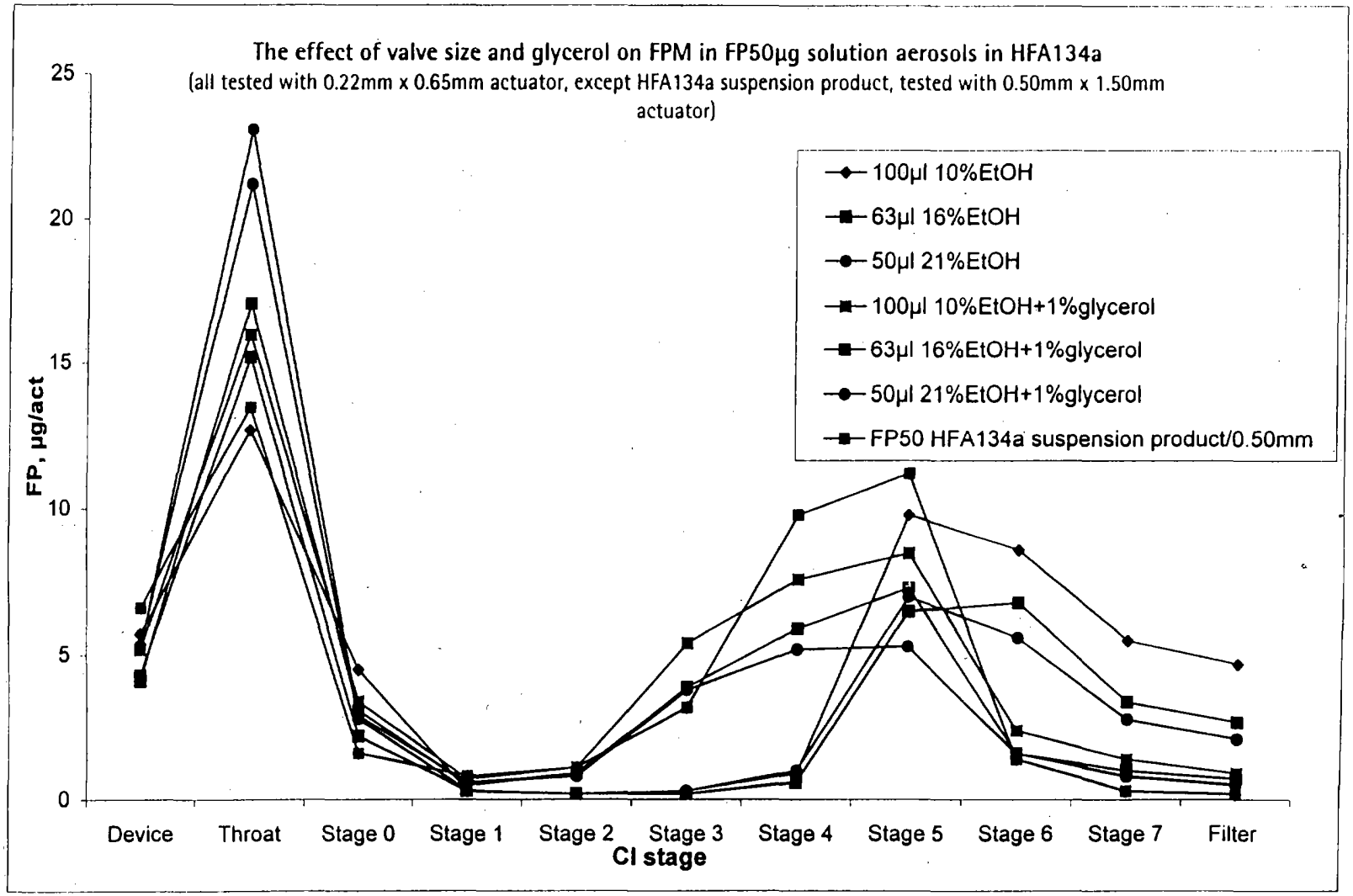

The effect of valve size and glycerol on FPM in FP50µg solution aerosols in HFA134a
(all tested with 0.22mm x 0.65mm actuator, except HFA134a suspension product, tested with 0.50mm x 1.50mm actuator)
100µl 10%EtOH
63µl 16%EtOH
50µl 21%EtOH
100µl 10%EtOH+1%glycerol
63µl 16%EtOH+1%glycerol
50µl 21%EtOH+1%glycerol
FP50 HFA134a suspension product/0.50mm
FP, µg/act
25
20
15
10
5
0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 2

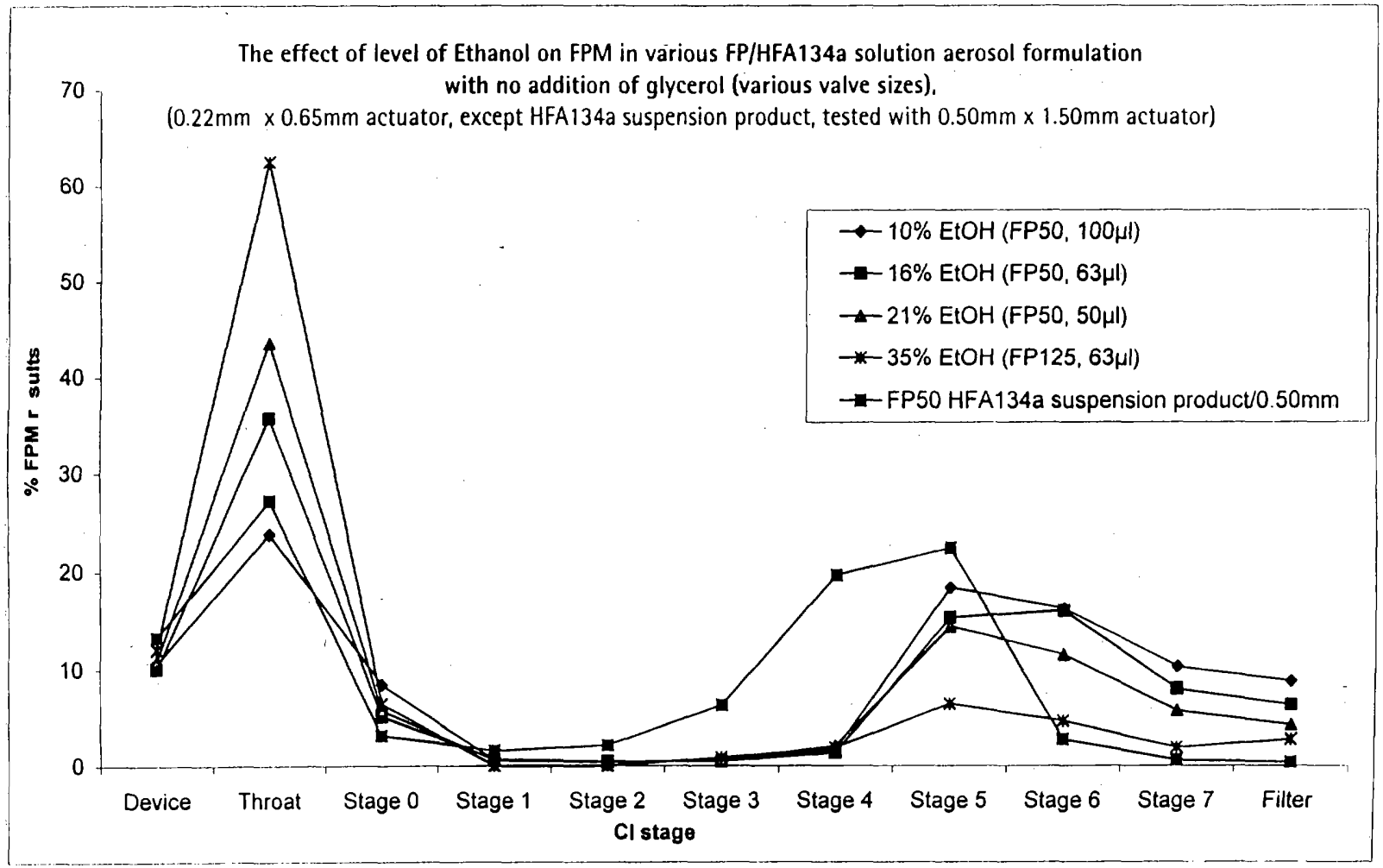

The effect of level of Ethanol on FPM in various FP/HFA134a solution aerosol formulation
with no addition of glycerol (various valve sizes),
(0.22mm x 0.65mm actuator, except HFA134a suspension product, tested with 0.50mm x 1.50mm actuator)
% FPM r sults
70
60
50
40
30
20
10
0
10% EtOH (FP50, 100µl)
16% EtOH (FP50, 63µl)
21% EtOH (FP50, 50µl)
35% EtOH (FP125, 63µl)
FP50 HFA134a suspension product/0.50mm
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 3

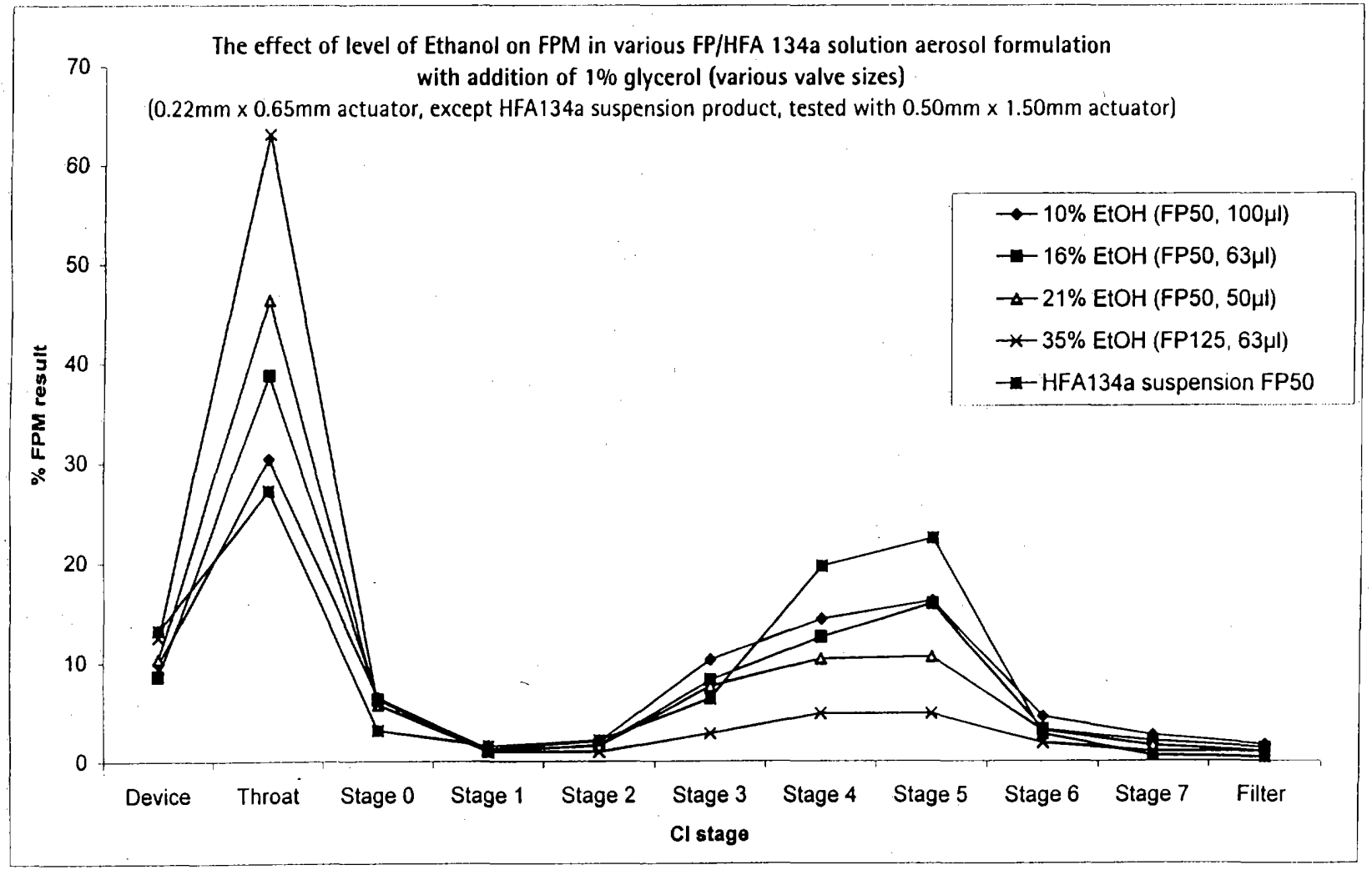

The effect of level of Ethanol on FPM in various FP/HFA 134a solution aerosol formulation
with addition of 1% glycerol (various valve sizes)
(0.22mm x 0.65mm actuator, except HFA134a suspension product, tested with 0.50mm x 1.50mm actuator)
% FPM result
70
60
50
40
30
20
10
0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage
10% EtOH (FP50, 100µl)
16% EtOH (FP50, 63µl)
21% EtOH (FP50, 50µl)
35% EtOH (FP125, 63µl)
HFA134a suspension FP50

Figure 4

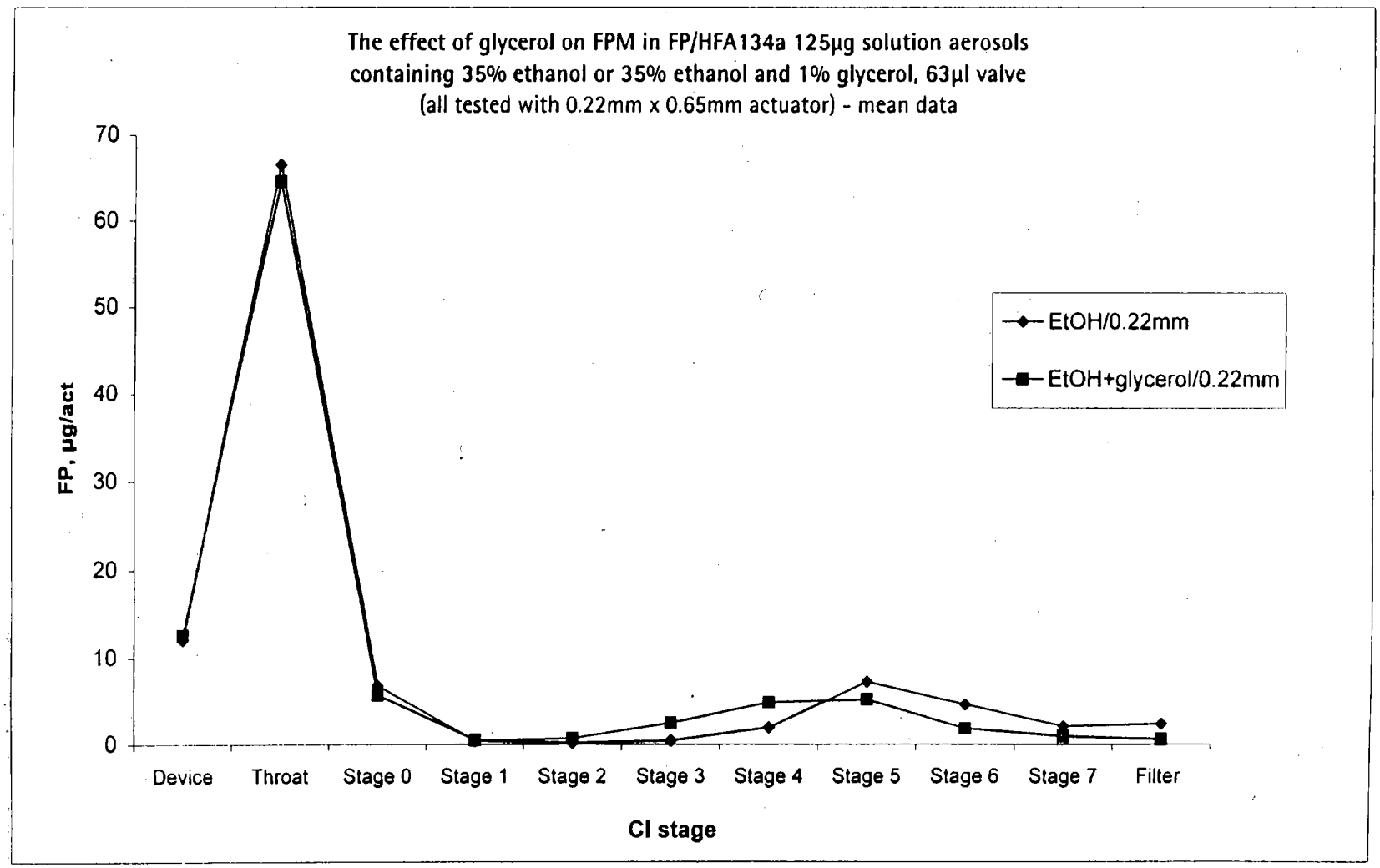

The effect of glycerol on FPM in FP/HFA134a 125µg solution aerosols containing 35% ethanol or 35% ethanol and 1% glycerol, 63µl valve (all tested with 0.22mm x 0.65mm actuator) - mean data
FP, µg/act
70
60
50
40
30
20
10
0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage
EtOH/0.22mm
EtOH+glycerol/0.22mm

Figure 5

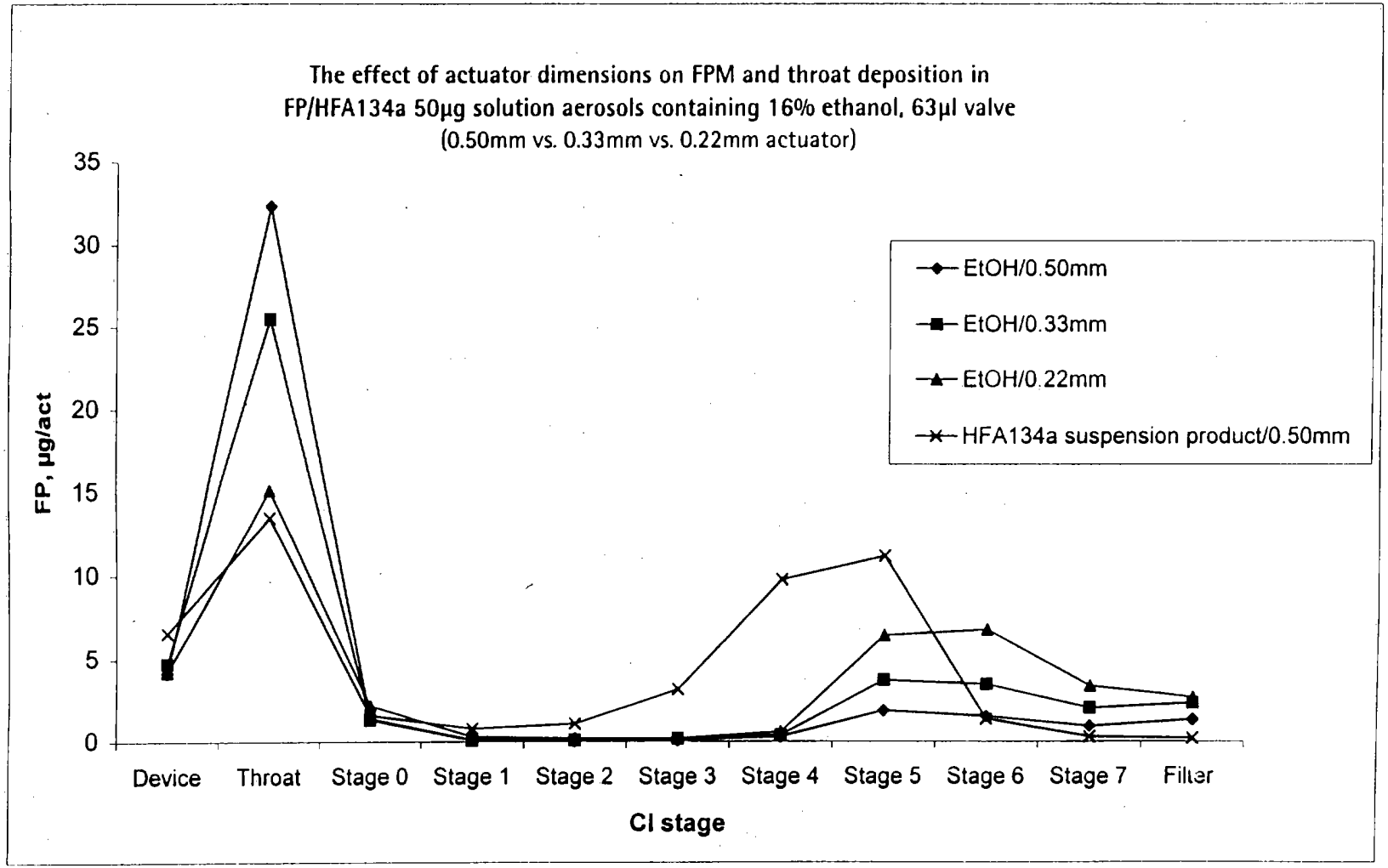

The effect of actuator dimensions on FPM and throat deposition in
FP/HFA134a 50µg solution aerosols containing 16% ethanol, 63µl valve
(0.50mm vs. 0.33mm vs. 0.22mm actuator)
FP, µg/act
35
30
25
20
15
10
5
0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage
EtOH/0.50mm
EtOH/0.33mm
EtOH/0.22mm
HFA134a suspension product/0.50mm

Figure 6

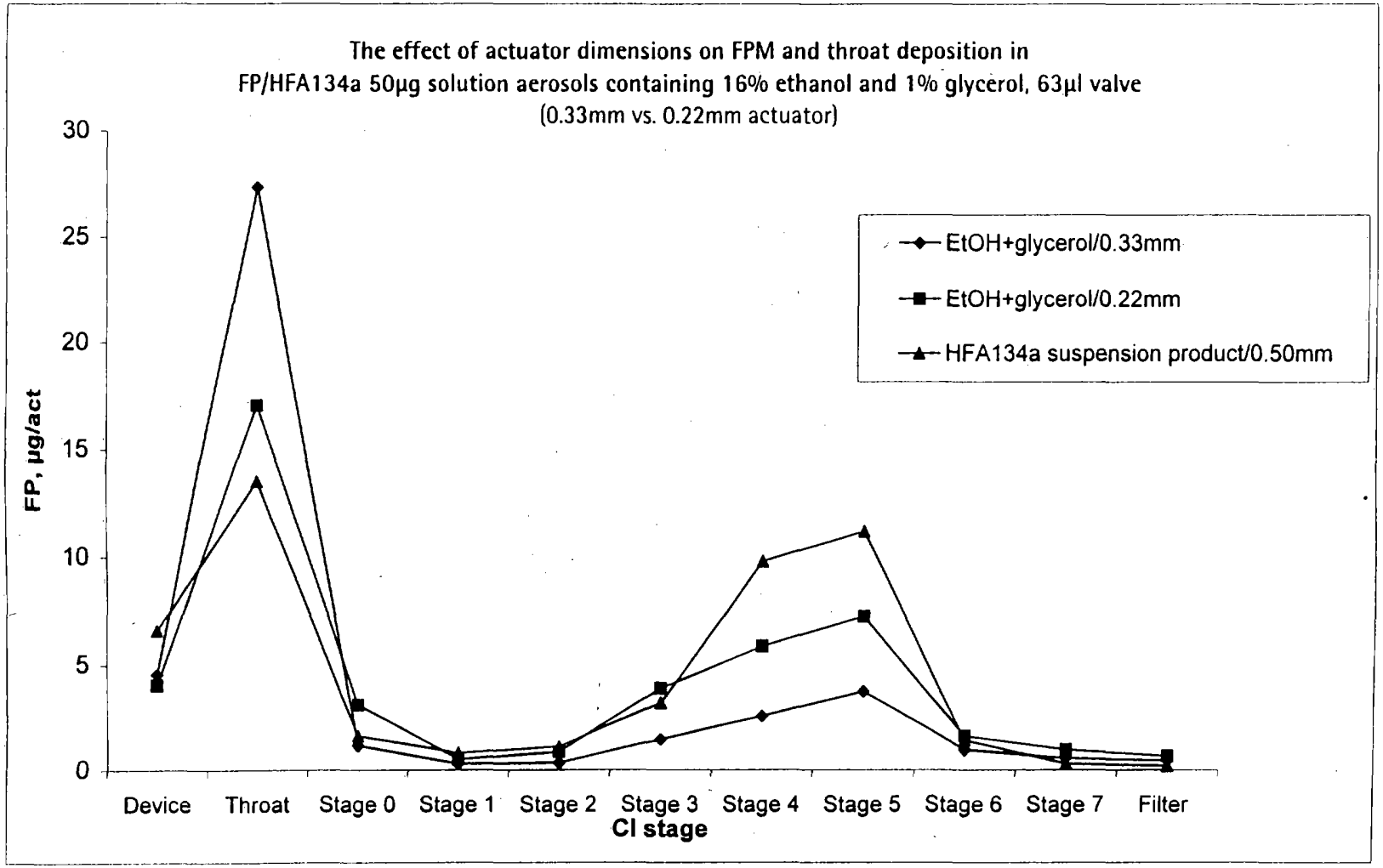

The effect of actuator dimensions on FPM and throat deposition in
FP/HFA134a 50µg solution aerosols containing 16% ethanol and 1% glycerol, 63µl valve
(0.33mm vs. 0.22mm actuator)
FP, µg/act
30
25
20
15
10
5
0
EtOH+glycerol/0.33mm
EtOH+glycerol/0.22mm
HFA134a suspension product/0.50mm
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 7

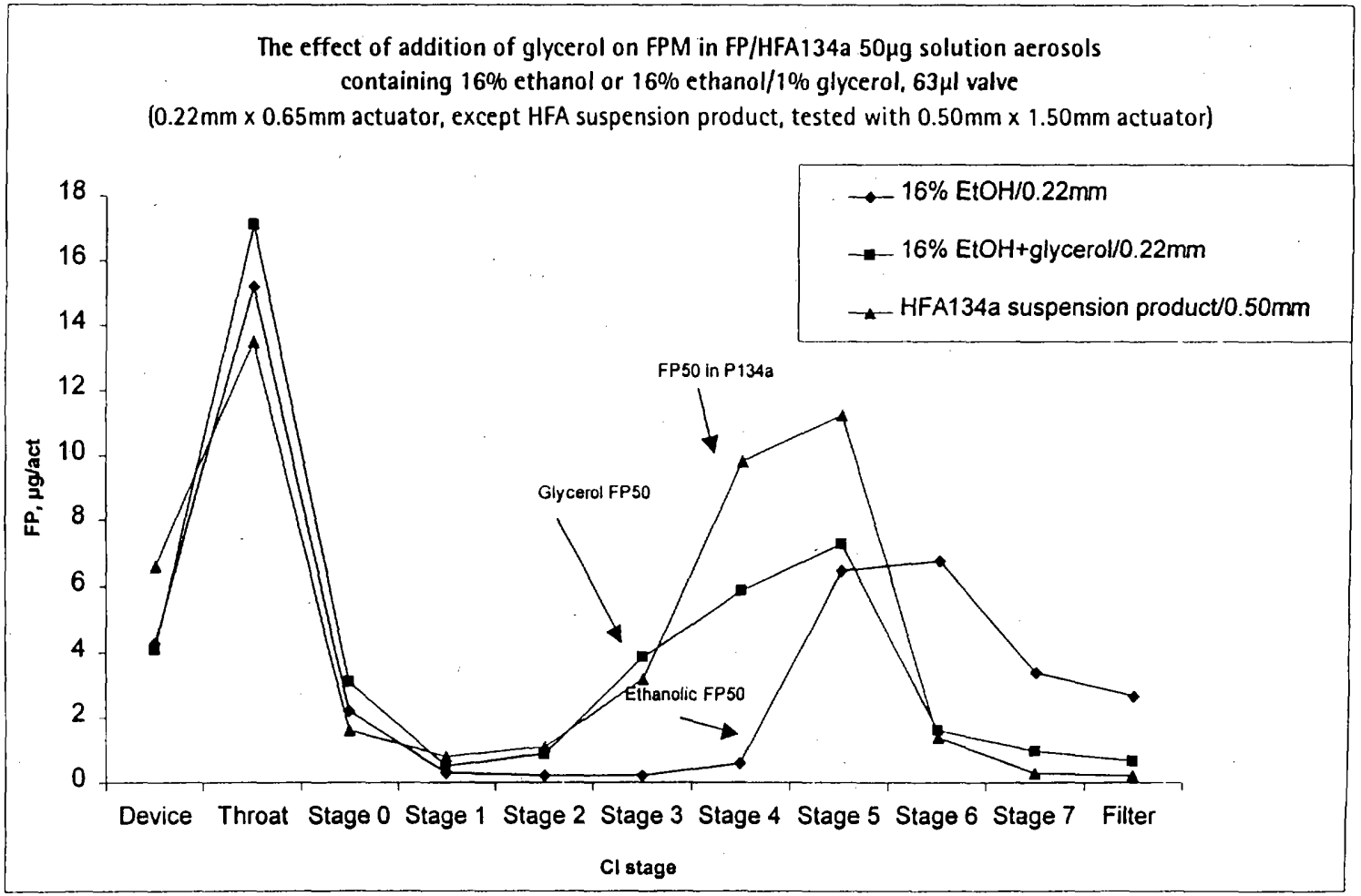

The effect of addition of glycerol on FPM in FP/HFA134a 50µg solution aerosols
containing 16% ethanol or 16% ethanol/1% glycerol, 63µl valve
(0.22mm x 0.65mm actuator, except HFA suspension product, tested with 0.50mm x 1.50mm actuator)
16% EtOH/0.22mm
16% EtOH+glycerol/0.22mm
HFA134a suspension product/0.50mm
FP50 in P134a
Glycerol FP50
Ethanolic FP50
FP, µg/act
0
2
4
6
8
10
12
14
16
18
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 8

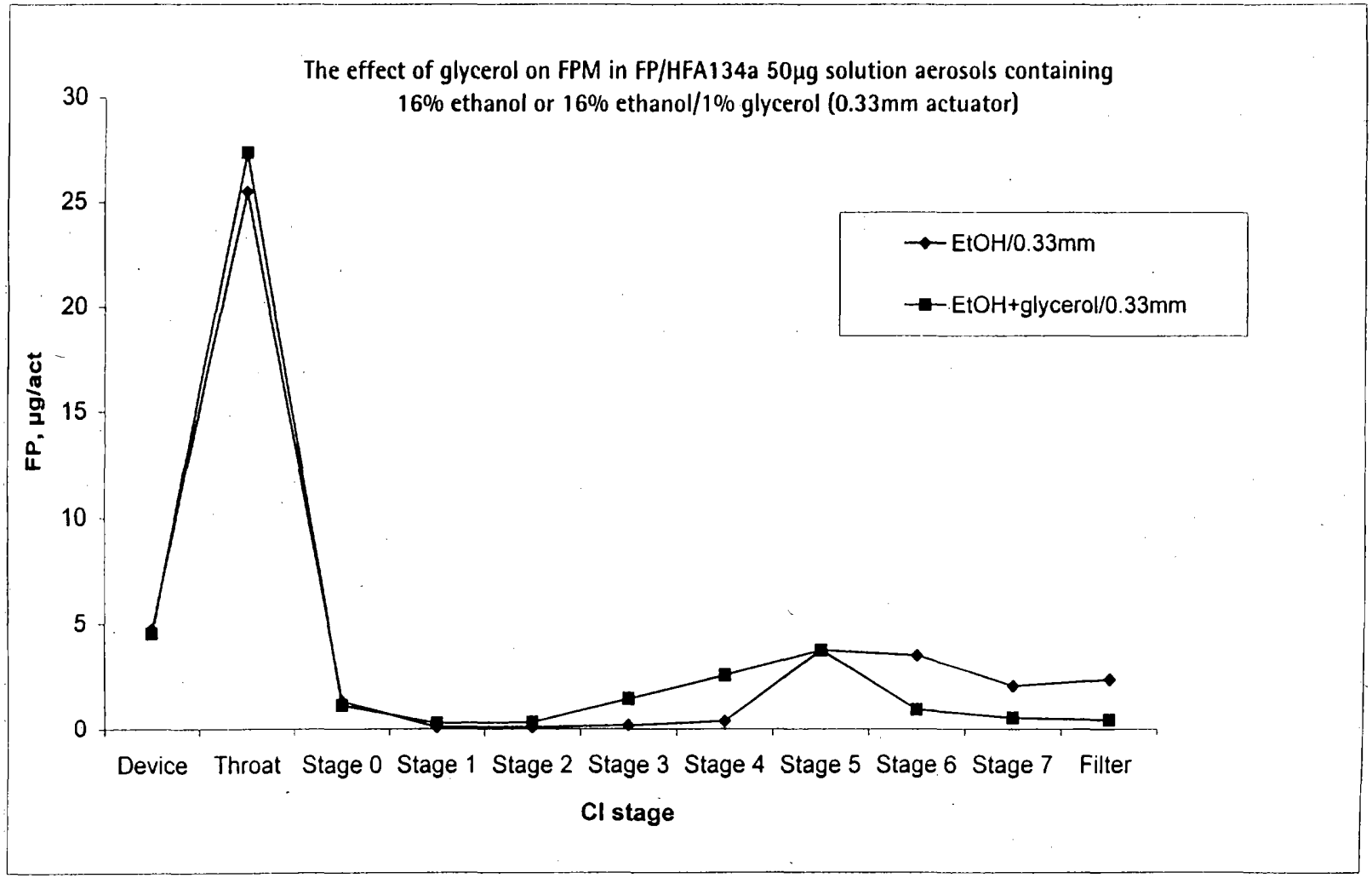

The effect of glycerol on FPM in FP/HFA134a 50µg solution aerosols containing 16% ethanol or 16% ethanol/1% glycerol (0.33mm actuator)
FP, µg/act
30
25
20
15
10
5
0
EtOH/0.33mm
EtOH+glycerol/0.33mm
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 9

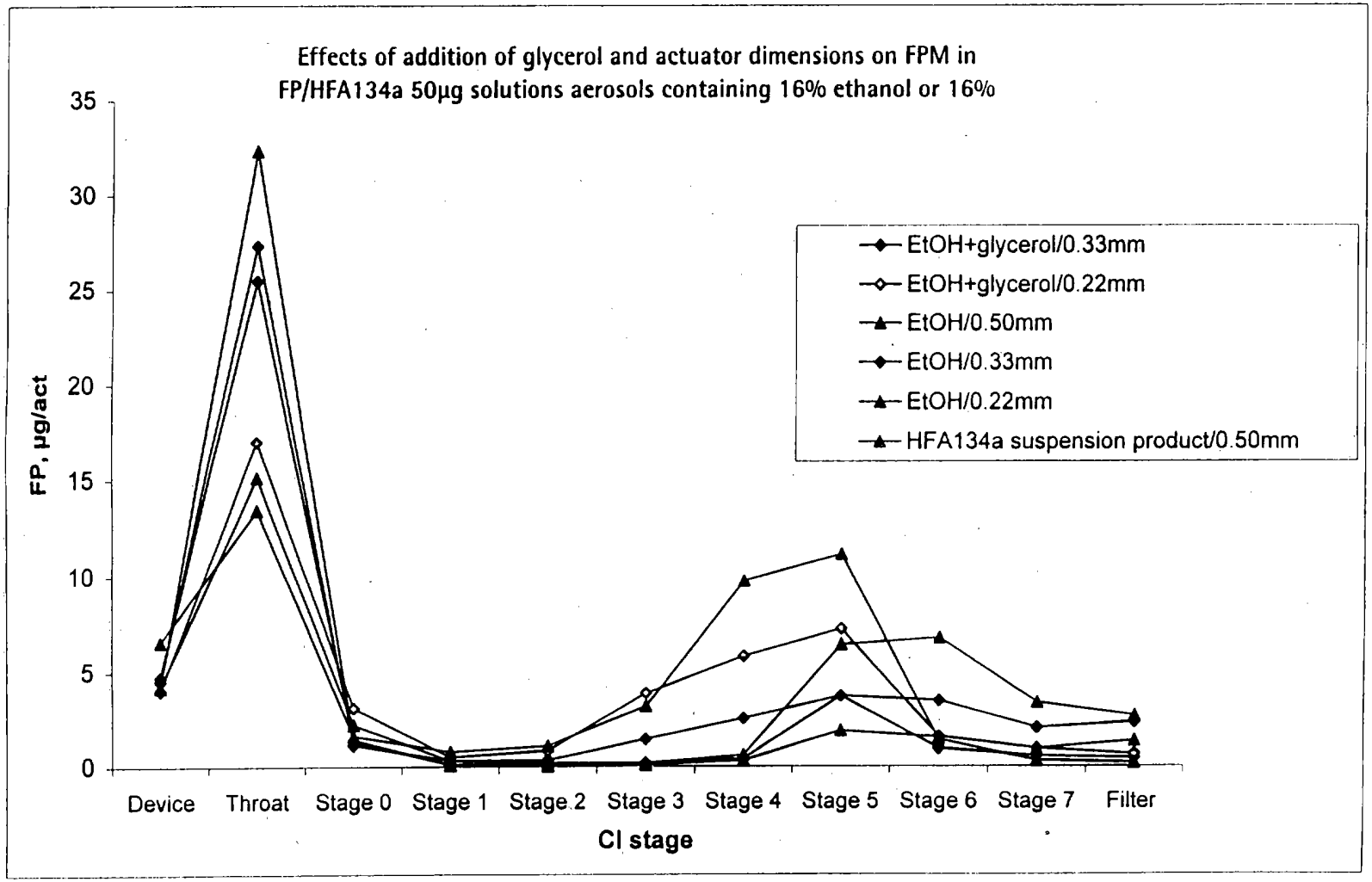

Effects of addition of glycerol and actuator dimensions on FPM in FP/HFA134a 50µg solutions aerosols containing 16% ethanol or 16%
FP, µg/act
35
30
25
20
15
10
5
0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage
EtOH+glycerol/0.33mm
EtOH+glycerol/0.22mm
EtOH/0.50mm
EtOH/0.33mm
EtOH/0.22mm
HFA134a suspension product/0.50mm

Figure 10

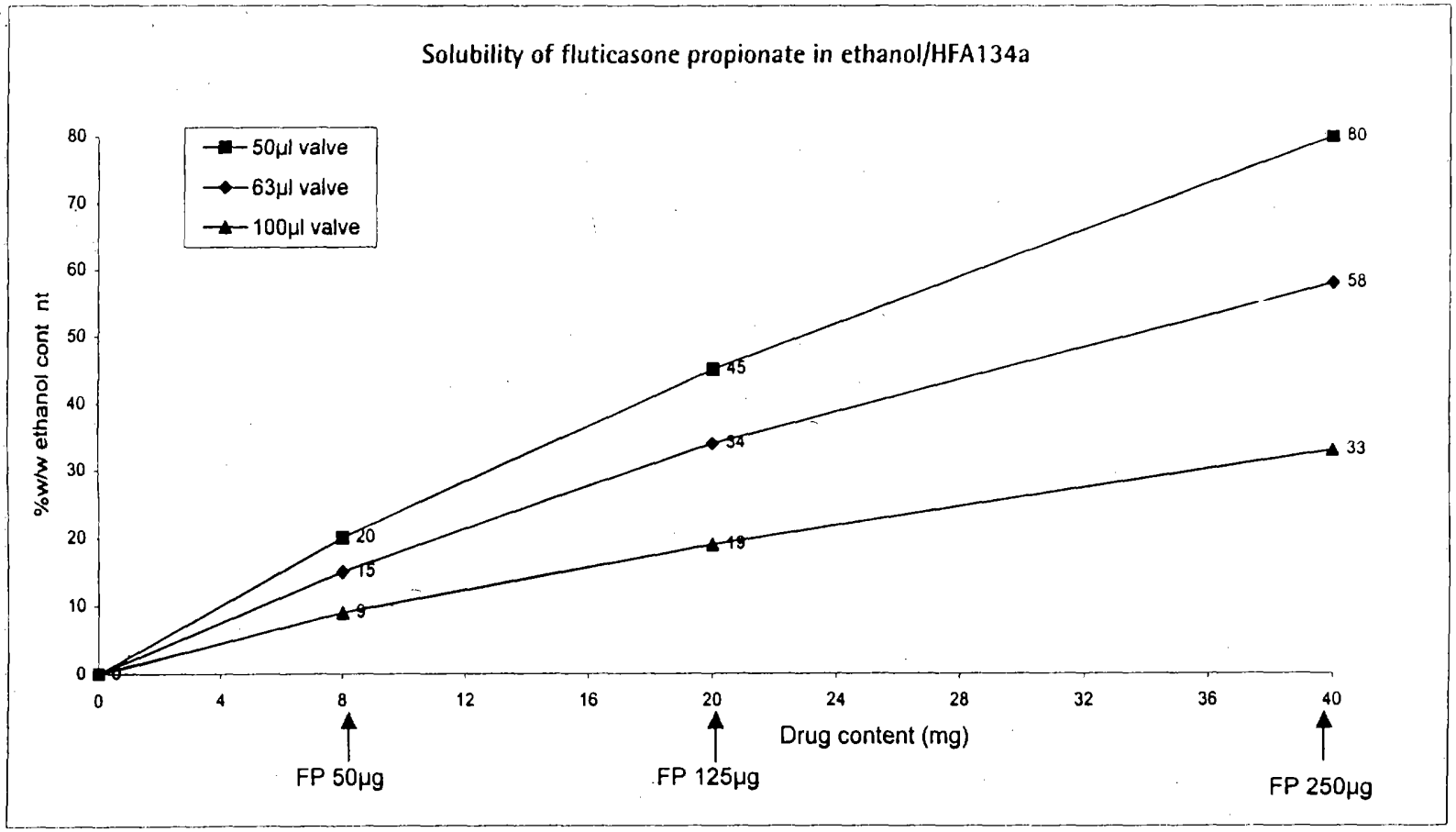

Solubility of fluticasone propionate in ethanol/HFA134a
50µl valve
63µl valve
100µl valve
%w/w ethanol cont nt
Drug content (mg)
FP 50µg
FP 125µg
FP 250µg
80
58
45
34
33
20
15
19
9
0
0
4
8
12
16
20
24
28
32
36
40
10
30
50
70
60

Figure 11

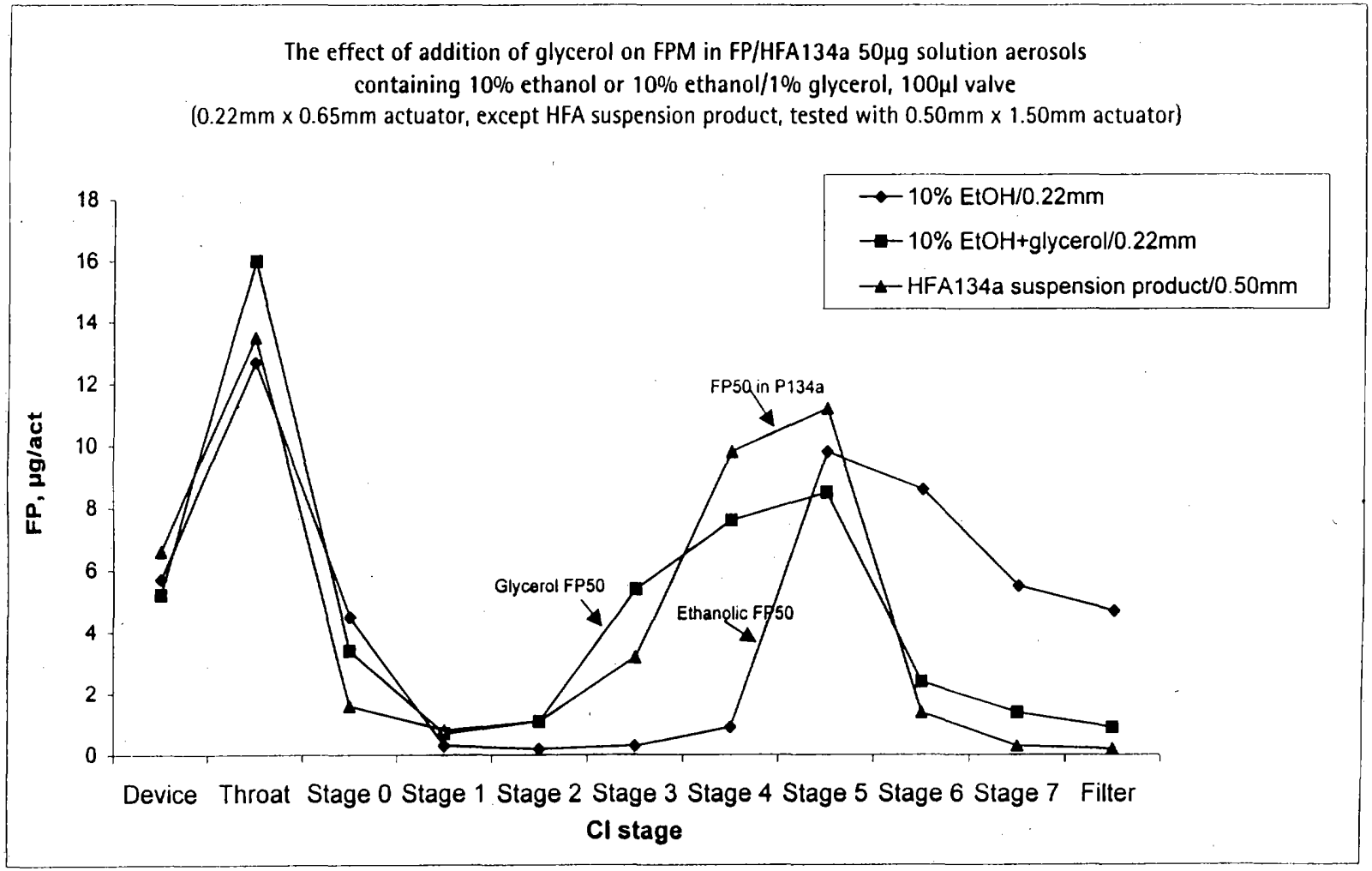

The effect of addition of glycerol on FPM in FP/HFA134a 50µg solution aerosols
containing 10% ethanol or 10% ethanol/1% glycerol, 100µl valve
(0.22mm x 0.65mm actuator, except HFA suspension product, tested with 0.50mm x 1.50mm actuator)
10% EtOH/0.22mm
10% EtOH+glycerol/0.22mm
HFA134a suspension product/0.50mm
FP, µg/act
18
16
14
12
10
8
6
4
2
0
FP50 in P134a
Glycerol FP50
Ethanolic FP50
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 12

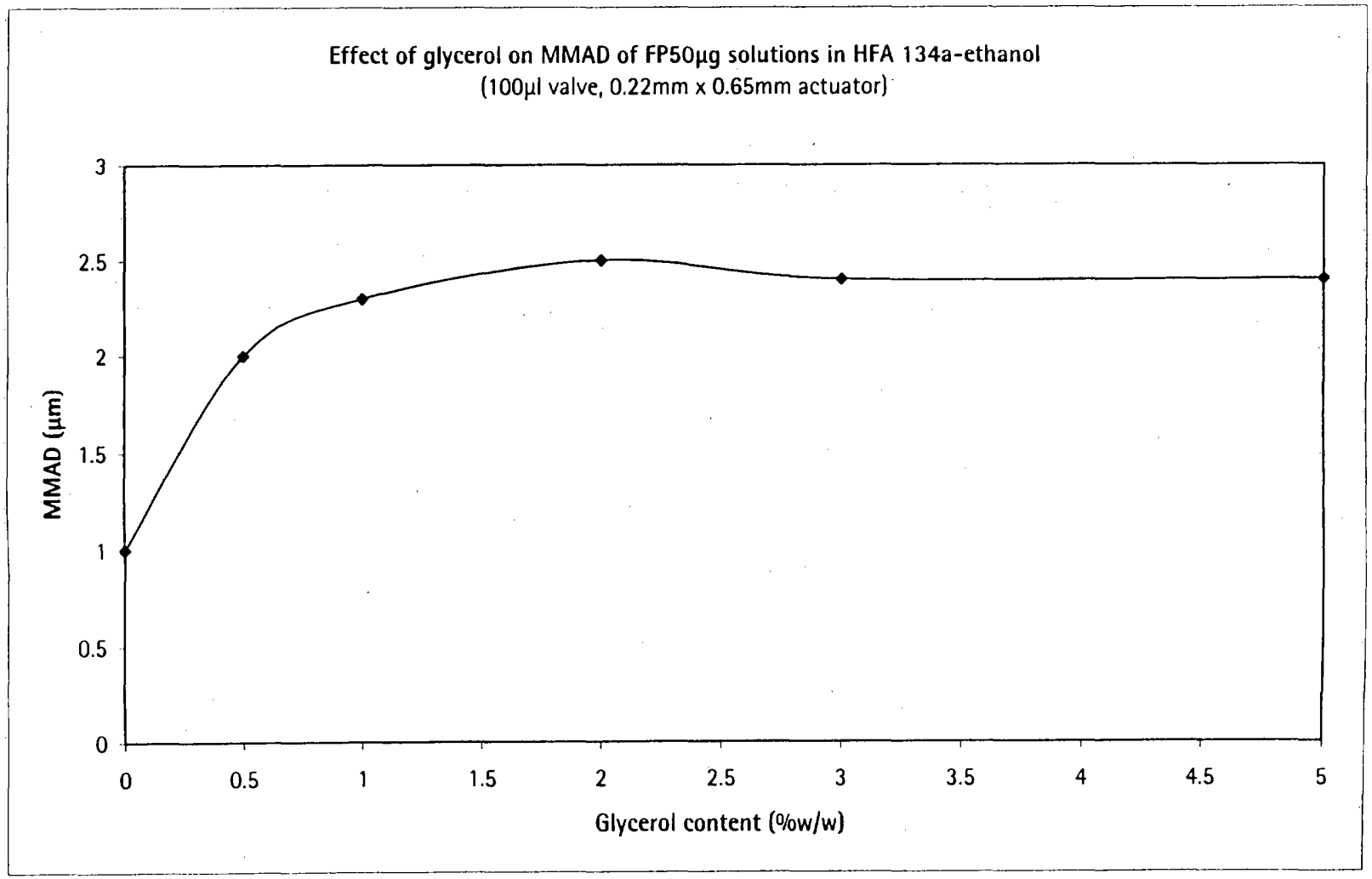

Effect of glycerol on MMAD of FP50µg solutions in HFA 134a-ethanol
(100µl valve, 0.22mm x 0.65mm actuator)
MMAD (µm)
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Glycerol content (%w/w)

Figure 13

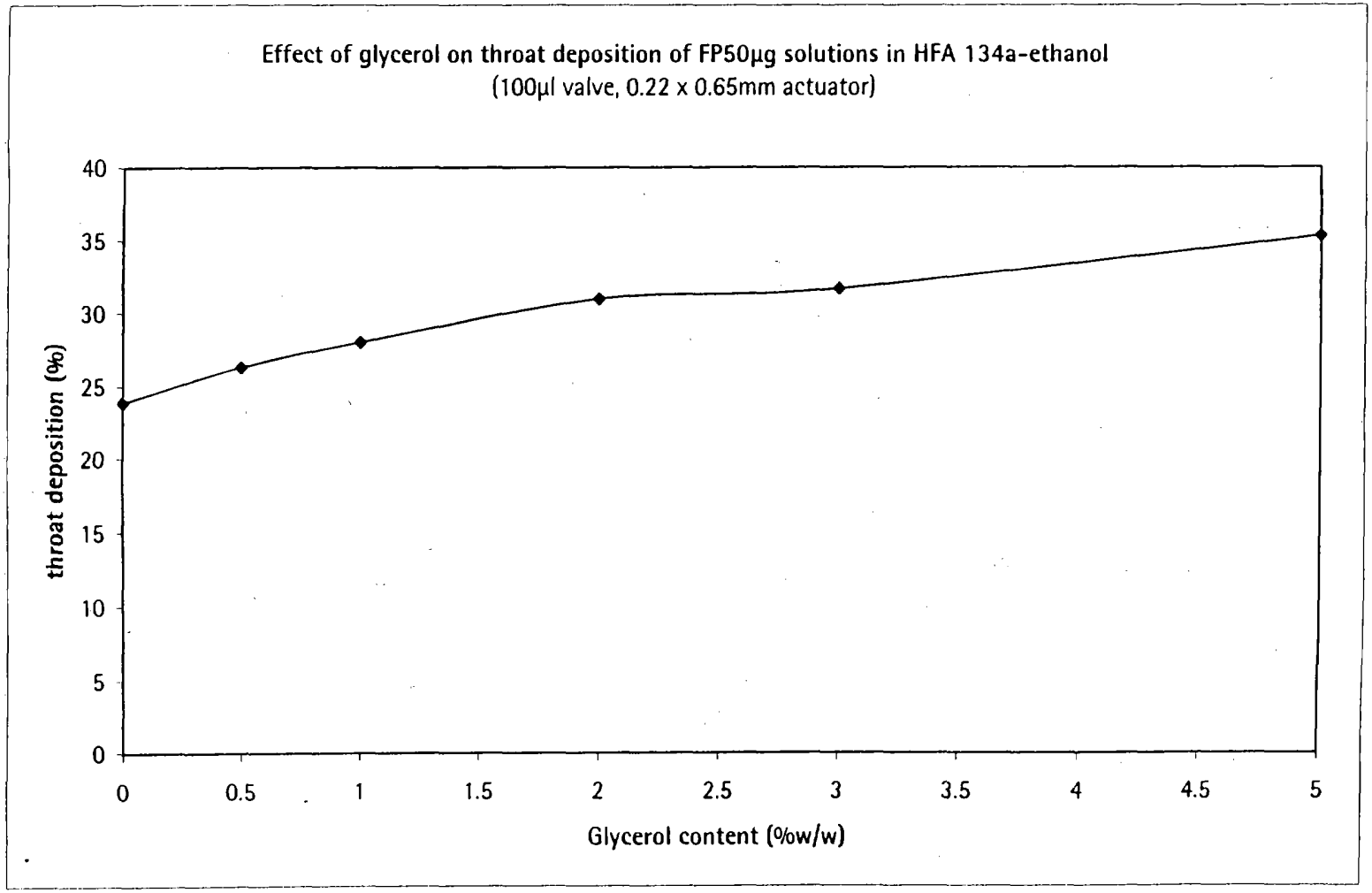

Effect of glycerol on throat deposition of FP50µg solutions in HFA 134a-ethanol
(100µl valve, 0.22 x 0.65mm actuator)
throat deposition (%)
40
35
30
25
20
15
10
5
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Glycerol content (%w/w)

Figure 14

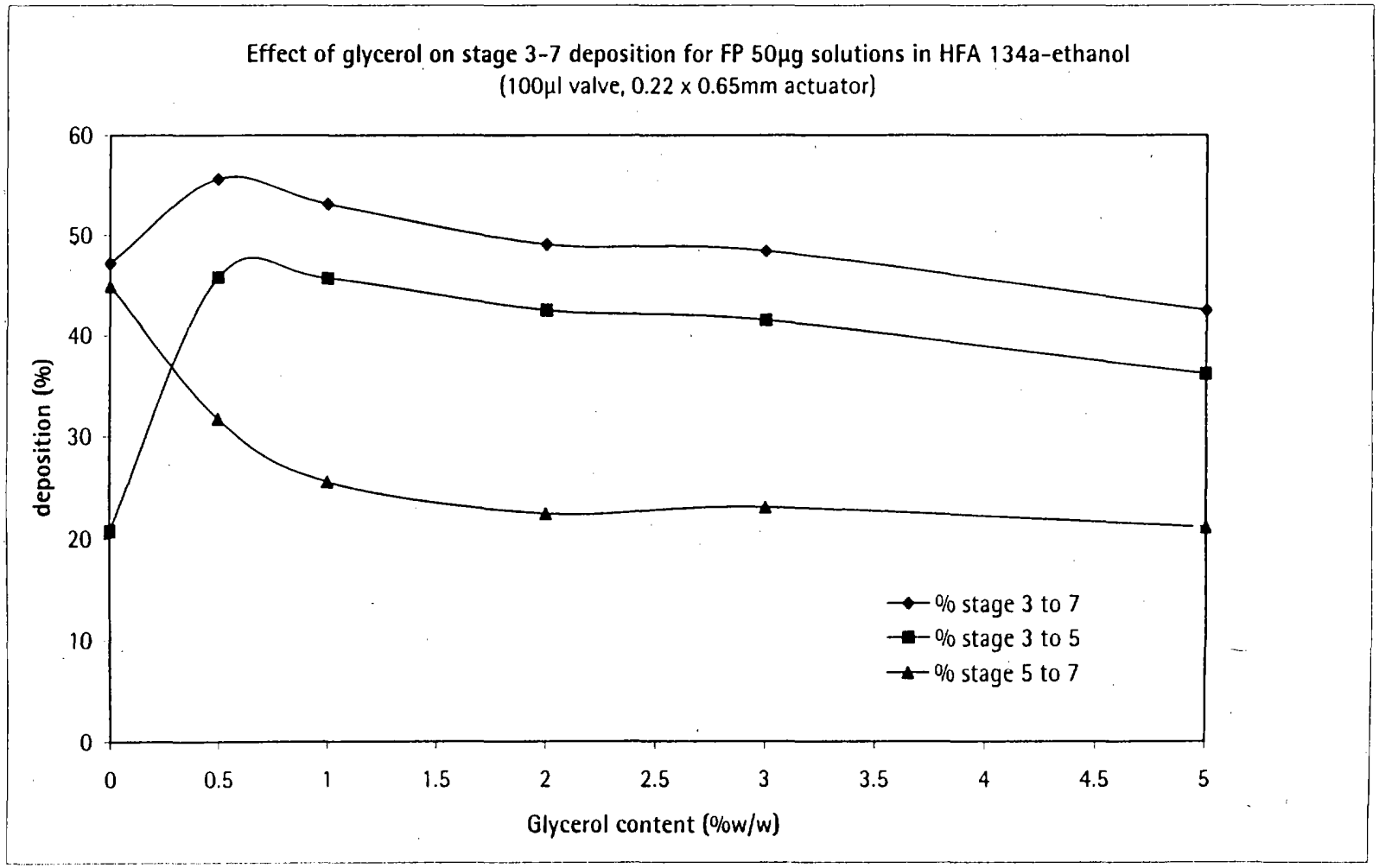

Effect of glycerol on stage 3-7 deposition for FP 50µg solutions in HFA 134a-ethanol
(100µl valve, 0.22 x 0.65mm actuator)
deposition (%)
60
50
40
30
20
10
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Glycerol content (%w/w)
% stage 3 to 7
% stage 3 to 5
% stage 5 to 7

Figure 15

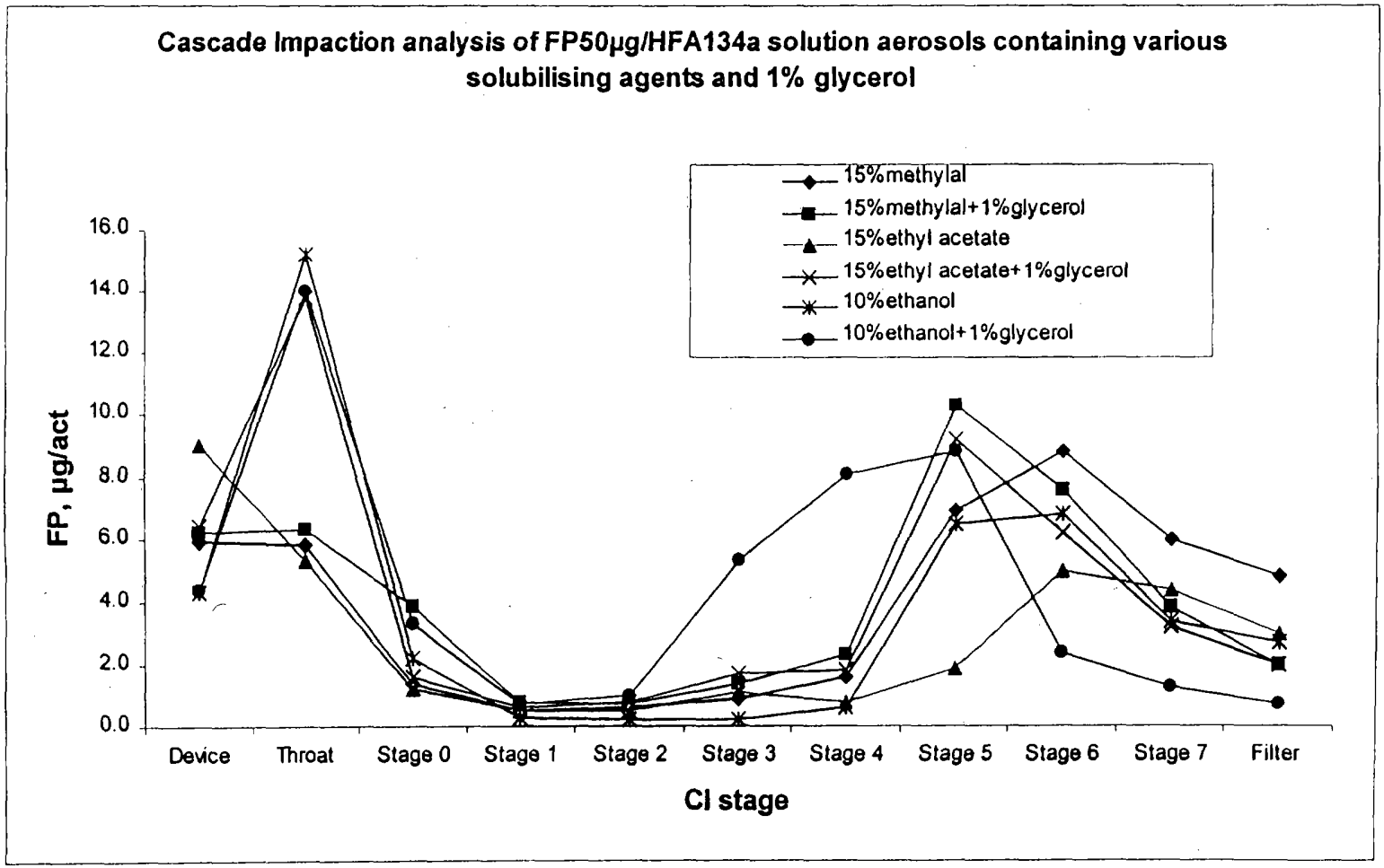

Cascade Impaction analysis of FP50µg/HFA134a solution aerosols containing various solubilising agents and 1% glycerol
15%methylal
15%methylal+1%glycerol
15%ethyl acetate
15%ethyl acetate+1%glycerol
10%ethanol
10%ethanol+1%glycerol
FP, µg/act
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 16

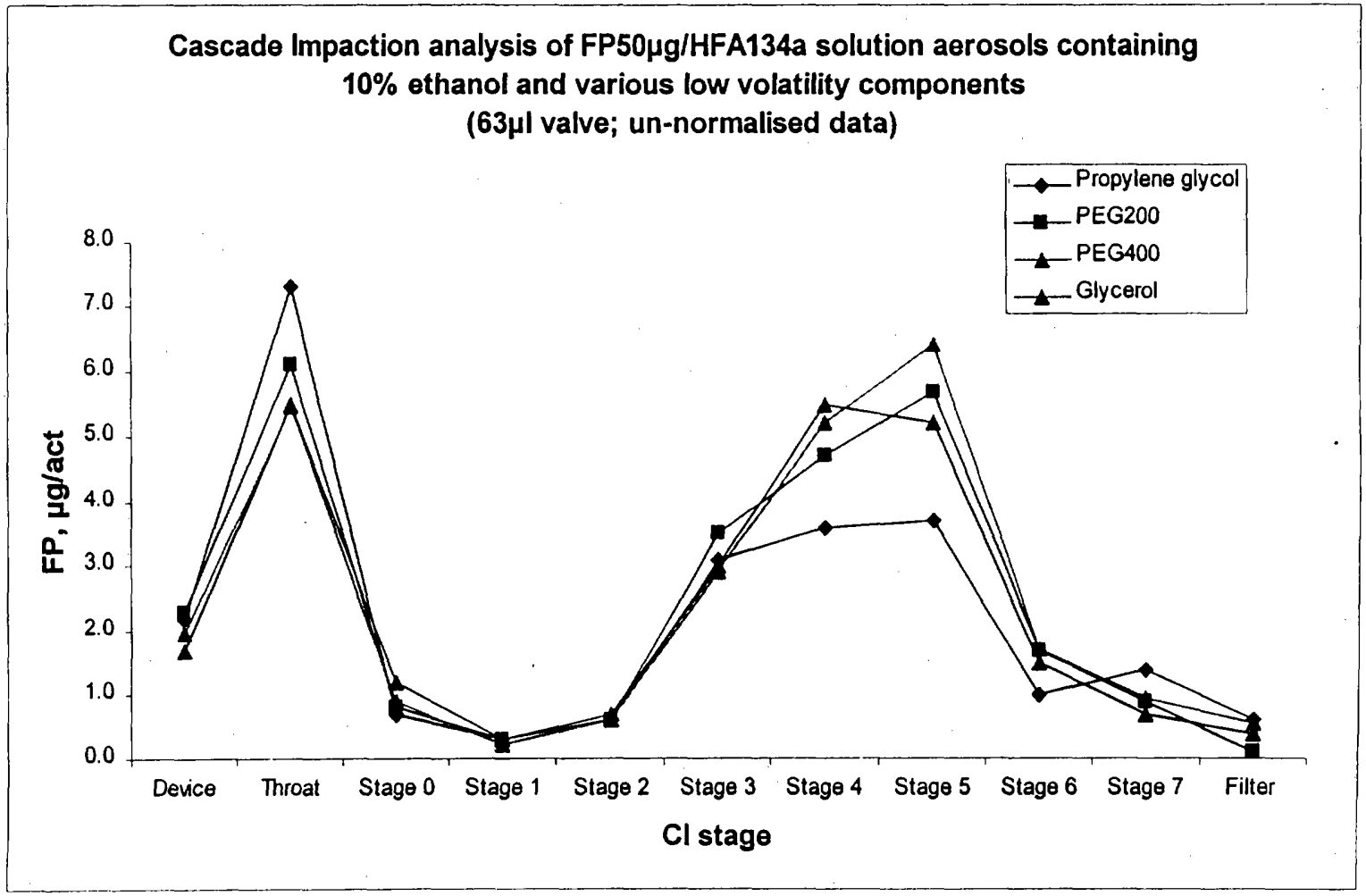

Cascade Impaction analysis of FP50µg/HFA134a solution aerosols containing
10% ethanol and various low volatility components
(63µl valve; un-normalised data)
Propylene glycol
PEG200
PEG400
Glycerol
FP, µg/act
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 17

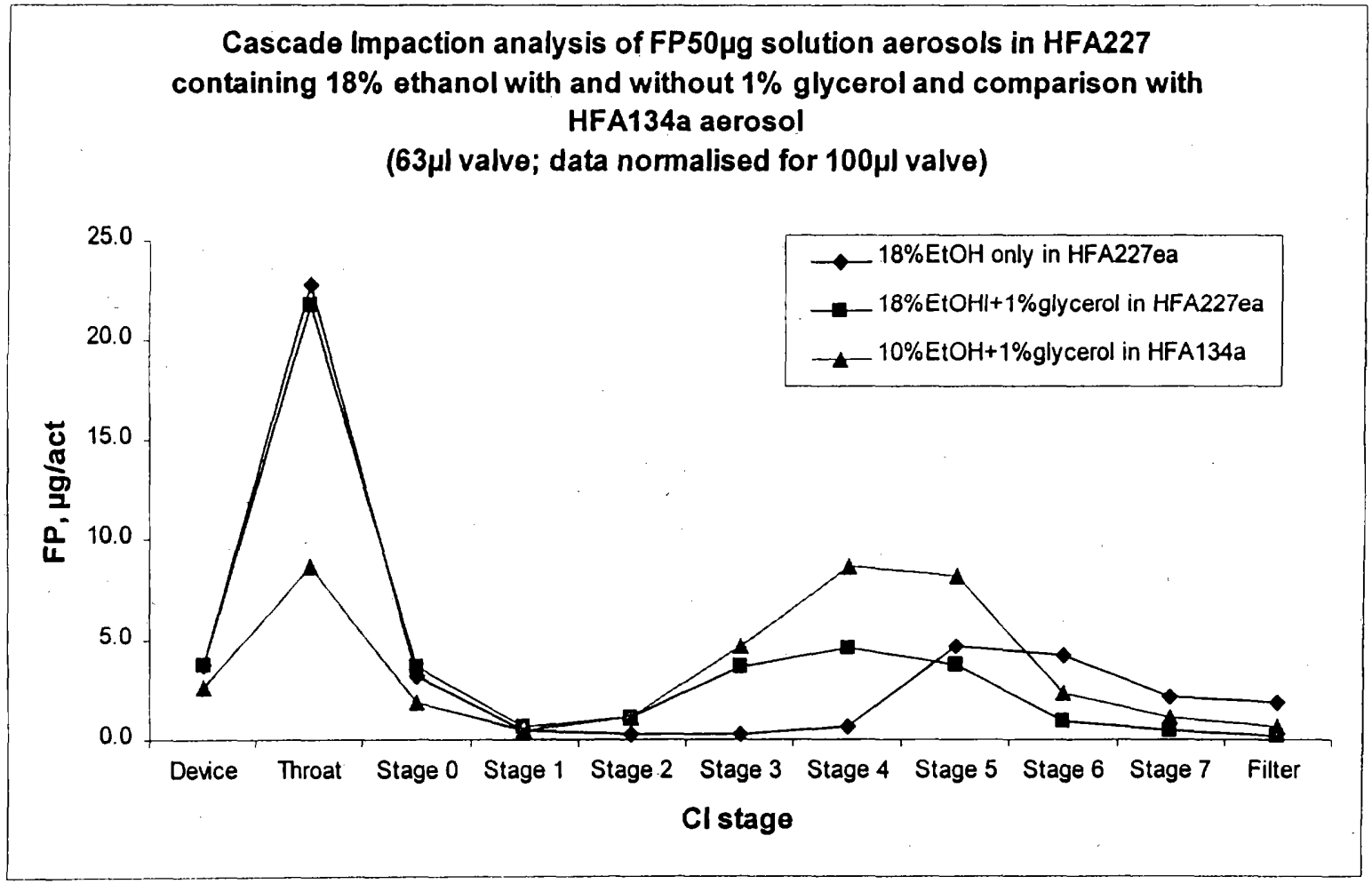

Cascade Impaction analysis of FP50µg solution aerosols in HFA227 containing 18% ethanol with and without 1% glycerol and comparison with HFA134a aerosol
(63µl valve; data normalised for 100µl valve)
18%EtOH only in HFA227ea
18%EtOHl+1%glycerol in HFA227ea
10%EtOH+1%glycerol in HFA134a
FP, µg/act
25.0
20.0
15.0
10.0
5.0
0.0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 18

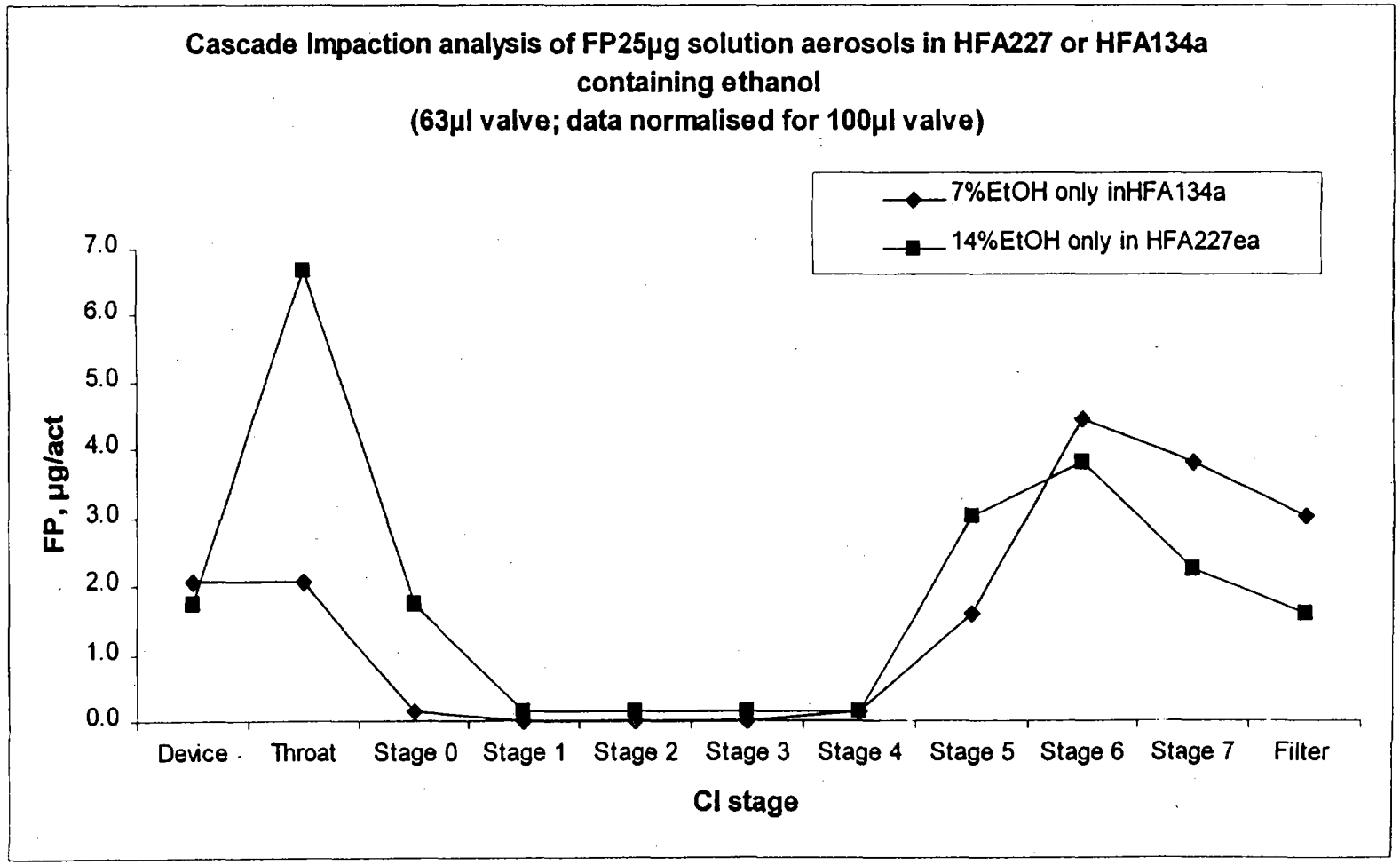
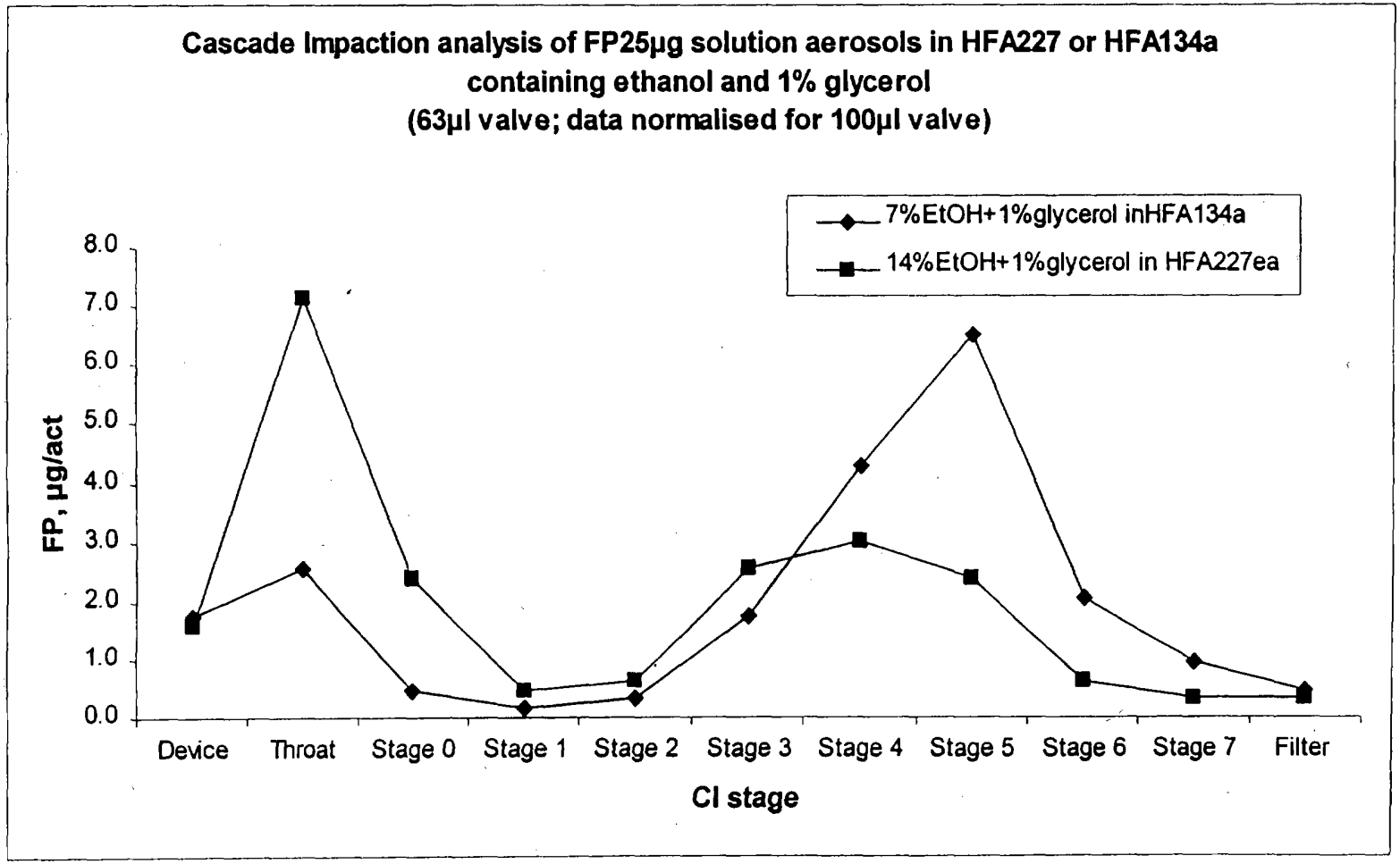

Cascade Impaction analysis of FP25µg solution aerosols in HFA227 or HFA134a containing ethanol
(63µl valve; data normalised for 100µl valve)
7%EtOH only inHFA134a
14%EtOH only in HFA227ea
FP, µg/act
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage

Figure 19


Cascade Impaction analysis of FP25µg solution aerosols in HFA227 or HFA134a containing ethanol and 1% glycerol (63µl valve; data normalised for 100µl valve)
7%EtOH+1%glycerol inHFA134a
14%EtOH+1%glycerol in HFA227ea
FP, µg/act
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Device
Throat
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Filter
CI stage